



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of :
Takumi KATSURAO et al.
Application S.N.: 10/553,442
Filed: February 3, 2006
For: POROUS FILM OF VINYLIDENE
FLUORIDE RESIN AND METHOD
FOR PRODUCING SAME

Confirmation No.1435
Attorney Docket No.2005_1625A
Group Art Unit: 1796
Examiner: William K. Cheung

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

DECLARATION UNDER 37 CFR 1.132

I, the undersigned, Takumi KATSURAO, hereby declare as follows:

1. I am a citizen of Japan and a resident of 1-10-13 Izumigaoka, Iwaki-shi, Fukushima-ken 971-8171 Japan.
2. In March 1986, I received my Bachelor of Science degree in Applied Chemistry from the Faculty of Science at the Tokyo University of Science. In August 1994, I received my Master of Science degree from the Department of Chemistry at a graduate school of Texas A&M University, U.S. Since April 1986, I have been employed at Kureha Corporation (formerly, Kureha Chemical Industry Company, Limited) and, except for the above-mentioned study period in the United States, I had conducted research and development in the field of, among others, chlorinated chemicals, catalysts, and fluorinated polymers, at Research Center of Kureha Corporation. At present, I work as a Manager at Intellectual Property Department in Kureha Corporation but I am still in charge of management of research and development in Research Center of Kureha Corporation.
3. I am an inventor of, among others, U.S. Patents Nos. 6,200,703; 6,686,427; 6,824,927; 7,208,555; and 7,452,387 directed to production and industrial applications of polyvinylidene fluoride.
4. I am one of the applicants of the application S.N.: 10/553,442

(hereinafter referred to as the instant application) and accordingly I am familiar with the specification and claims of the instant application.

5. Moreover, I have read carefully and I am familiar with the Official Action dated January 5, 2010, which action rejected Claims 1 – 12 of the instant application. I have read carefully and I am familiar with several references, inclusive of Meguro et al. (US 6,327,136), Kashio et al (US 5,776,637) and Muller et al. (US US 5,066,401) cited for rejecting the above-mentioned claims.

The substance of the Examiner's rejection is believed to be based on the conclusion that Claims 1 – 12 are unpatentable as being anticipated by or, in the alternative, obvious over Meguro et al. (US 6,327,136) or Kashio et al (US 5,776,637) alone or in view of Muller et al. (US US 5,066,401). Particularly, the limitation of “consisting essentially of” recited in Claim 1 of the instant application is insufficient without experimental data to show that the ingredients other than the components being claimed in fact can affect the properties of the vinylidene fluoride resin being claimed (Item 12 of the Official Action).

6. In order to try to traverse the Examiner's conclusion, I have, under my direction and control, conducted some experimental tests during the period of from March 26 to April 30, 2010 for demonstrating that the carbon materials essentially required by Meguro et al. (US 6,327,136) and Kashio et al (US 5,776,637) other than the components being claimed in the instant application can, in fact, affect the properties of the claimed porous membrane of vinylidene fluoride resin. The procedure and the results of the experimental tests are reported hereinbelow.

<<EXPERIMENTS>>

(Test 1)

An electrode layer was formed in substantially the same manner as in Example 1 of Meguro et al. (US 6,327,136).

More specifically, 9 g (90 wt. parts) of pitch-based activated carbon powder (BET specific surface area =1200 m²/g; “BAC PW15” made by Kureha Corporation) and 0.2 g (2 wt. parts) of carbon black (“DENKA BLACK” made by Denki Kagaku Kogyo K.K.) were blended with 8 g (80 wt. parts) of 10 wt.% solution in N-methyl-2-pyrrolidone of polyvinylidene fluoride having an inherent viscosity of 1.7dl/g (“KF # 1710” made by Kureha Corporation), and further 11.4 g (114 wt. parts) of N-methyl-2-pyrrolidone and 4.7 g (47 wt. parts) of an adipic acid-based polyester plasticizer (“ADEKACIZER PN150” made by Asahi Denka Kogyo K.K.) were added thereto, followed by mixing at 30 °C to form a slurry-form electrode-forming

composition.

The electrode-forming composition was applied by means of a doctor blade on a part of and over a whole width of an about 20 μ m-thick and 20 mm-wide aluminum foil, and dried under heating at 130 $^{\circ}$ C for 30 min. to form an about 250 μ m-thick coating electrode layer. The thus-formed coated electrode sheet was immersed in methylene chloride at room temperature for 30 min. to extract the polyester plasticizer and dried at 130 $^{\circ}$ C for 10 min. The resultant two electrode sheets are shown in Fig. 1 attached hereto. One of the sheets was bent as shown in Fig. 2, and the electrode layer thereon was peeled off as shown in Fig. 3, whereby the peeled electrode was broken into pieces as shown in Fig. 4 because of fragility.

(Test 2)

A hollow-fiber porous membrane was prepared by repeating the procedure of Example 1 of the instant application. The states of the resultant hollow fiber are shown in Figs. 5A, and the hollow-fiber porous membrane showed tenacity as giving a tensile strength of 17.8 MPa shown in Table 2 of the instant application. A portion of the hollow fiber and a severed end are shown in Fig. 5B. Further, a cross-section of the hollow fiber is shown in Fig. 5C.

(Test 3)

A flat porous membrane was prepared in the following manner.

33 wt. parts of vinylidene fluoride copolymer (VDF/HEMA=100/1 by weight) prepared in Example 1 of the instant application, 20 wt. parts of the adipic acid-based polyester plasticizer ("ADEKACIZER PN150" made by Asahi Denka Kogyo K.K.) and 47 wt. parts of N-methyl-2-pyrrolidone were kneaded on an equi-directionally rotating twin-screw extruder ("BT-30" made by K.K. Plastic Kogaku Kenkyuuso) at a barrel temperature of 190 $^{\circ}$ C and subjected to a vacuum suction at a vacuum of 600 mm Hg and a barrel temperature of 210 $^{\circ}$ C to remove about 80 % of N-methyl-2-pyrrolidone at a position near the exit of the extruder. The kneaded mixture was extruded through a 3 mm-dia. die and cooled and solidified on a cooling drum to provide pellets. The thus-prepared pellets were supplied to a 35 mm-dia. single-screw extruder and extruded through a 350 mm-wide T-die at 190 $^{\circ}$ C, and the extrudate was guided to a cooling drum held at a surface temperature of 80 $^{\circ}$ C to be cooled and solidified thereon. The thus-formed sheet was immersed in methylene chloride at room temperature to extract the polyester plasticizer and the remainder of the N-methyl-2-pyrrolidone, followed by 30 minutes of drying in an oven at 100 $^{\circ}$ C to remove the methylene chloride, whereby a flat porous membrane was obtained.

A portion of the flat porous membrane showed an appearance as shown in Fig. 6A attached hereto and also showed tenacity when pulled by fingers as shown in Fig. 6B. The flat porous membrane showed a porosity of 35 % as calculated by dividing its weight with a product of its apparent volume and a true density (1.78 g/cm³) of polyvinylidene fluoride, and also tensile strengths of 35.6 MPa in the machine direction and 33. 2 MPa in the transverse direction.

<<Evaluation>>

The results in Test 1 (and Figs. 1 to 4) in comparison with Tests 2 and 3 (and Figs. 5A – 5C and Figs. 6A – 6B) show that the carbon materials essentially required by Meguro et al. (US 6,327,136) and Kashio et al (US 5,776,637) in addition to the vinylidene fluoride copolymer claimed in the instant application can, in fact, affect the properties of the claimed porous membrane of vinylidene fluoride resin, and particularly substantially deprive of a tenacity and a shape-retaining integrity essentially required of a hollow-fiber porous membrane for water treatment or a separator of batteries for which the porous membrane of the instant application is intended to be used.

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Dated: May 25 , 2010



Takumi KATSURAO

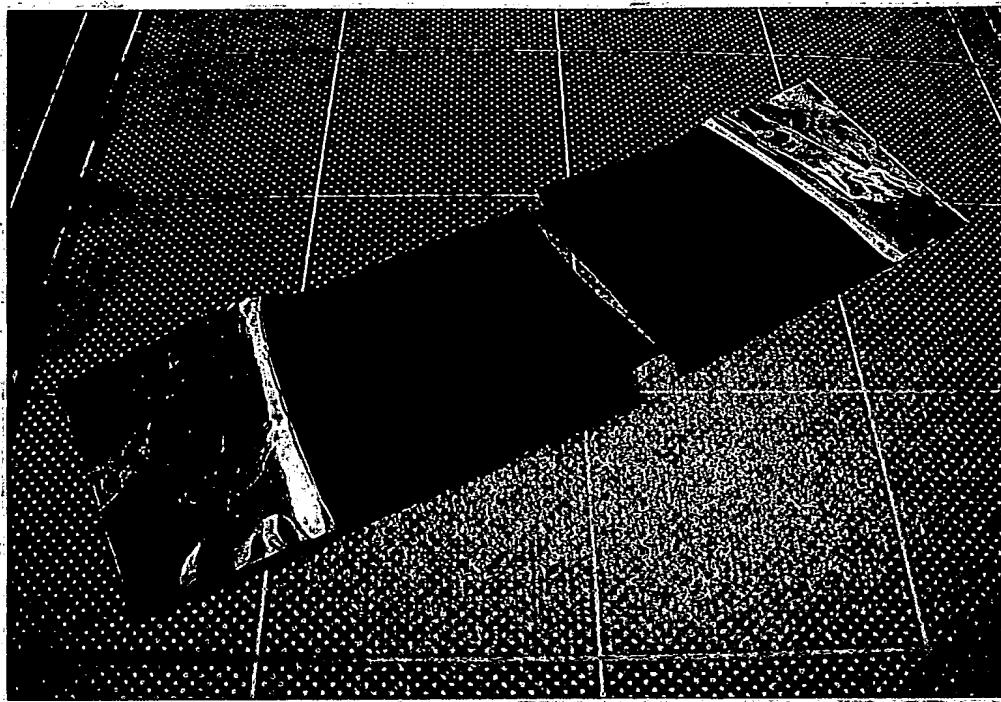


FIG. 1

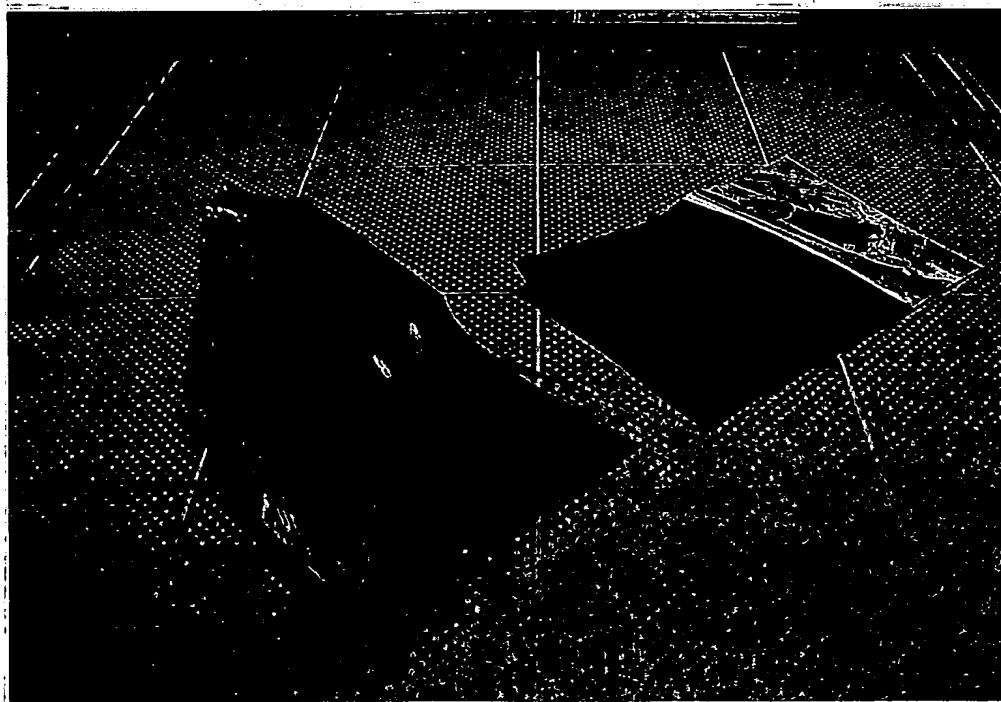


FIG. 2



FIG. 3

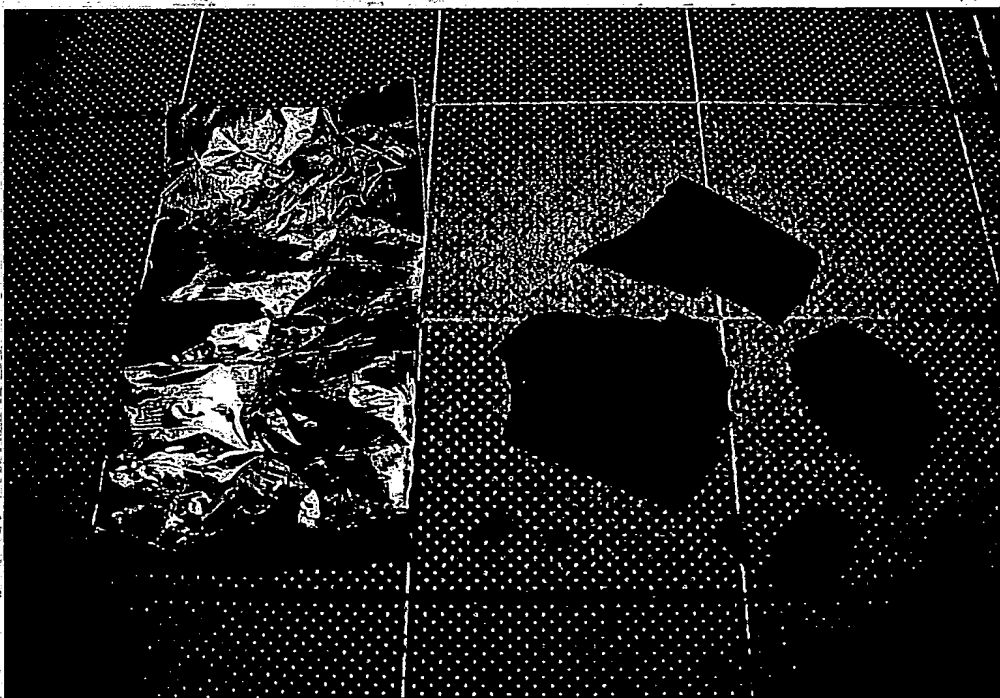


FIG. 4

FIG. 5A

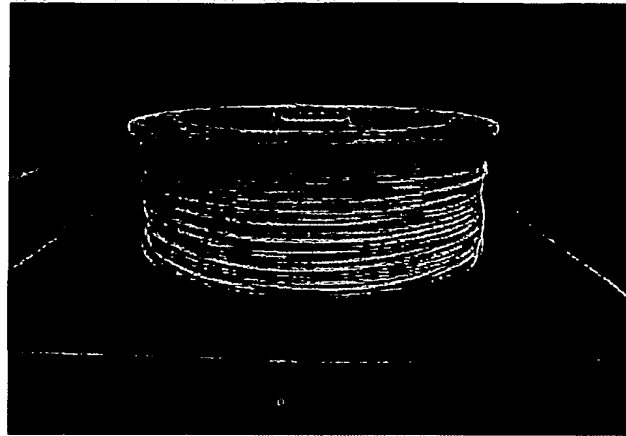


FIG. 5B

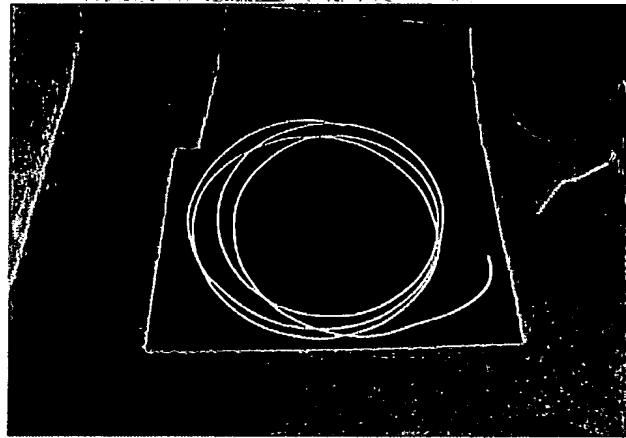
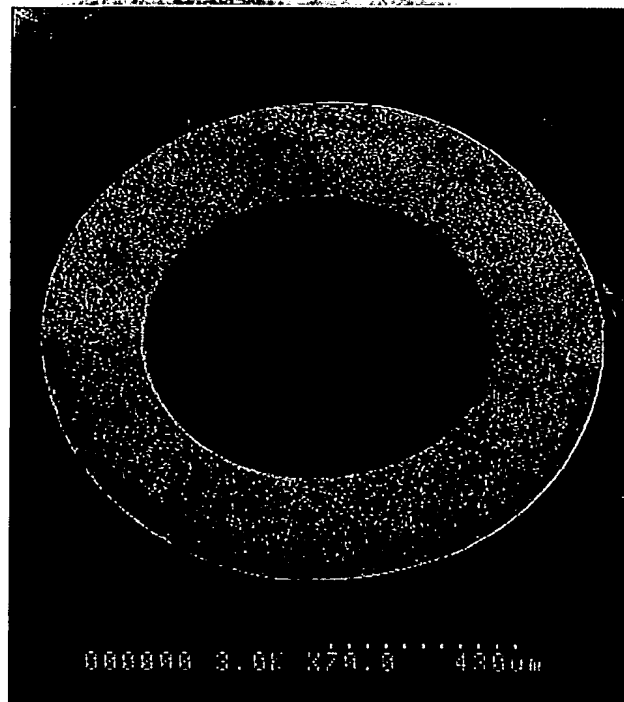


FIG. 5C



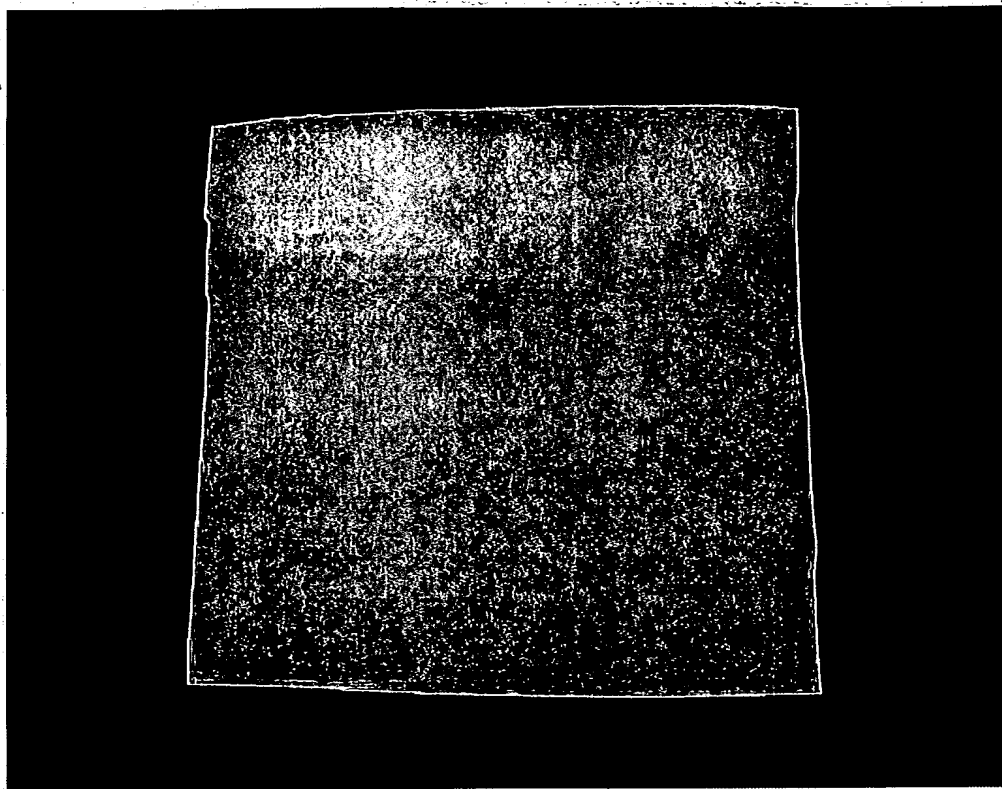


FIG. 6A

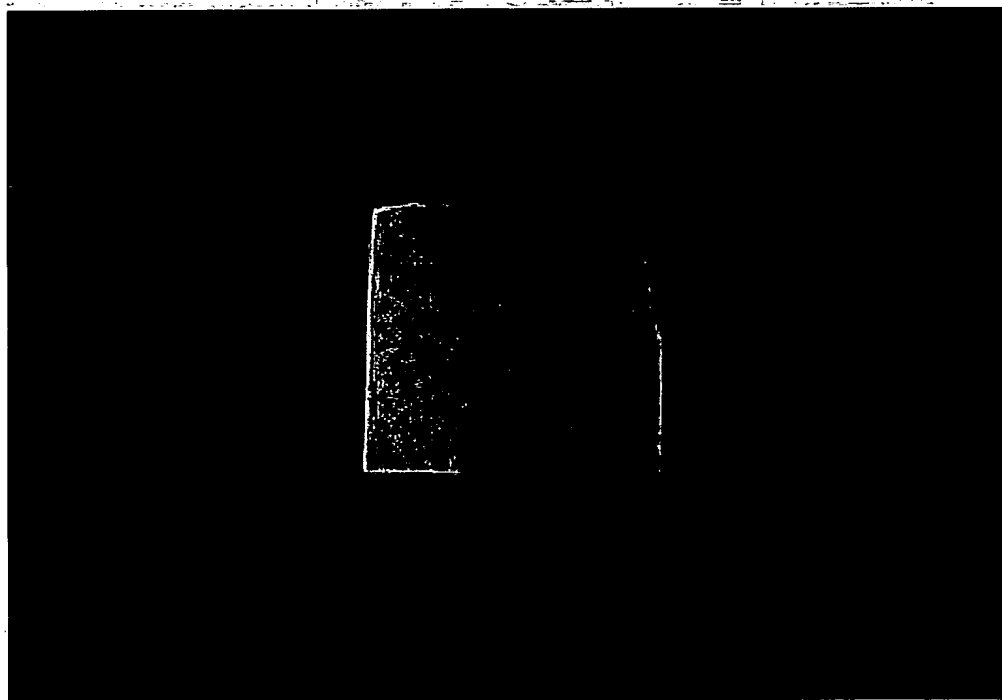


FIG. 6B